Evolution of QOR

Query On Release - An Industry Initiative

Query on Release Specification

- developed in conjunction with industry participation (e.g., Bell Atlantic and Bellcore have had industry meetings)

Bellcore

- developing specifications to incorporate LRN and QOR into one industry accepted document
- building on the industry QOR document (editor is NORTEL) that is currently available to the industry

ANSI

- T1S1.3 QOR and LRN work is progressing in parallel

Definitions:
AT&T's LRN - the architecture including triggers presented by AT&T to the LNP Task Force in CA.
lrn - the routing information required between networks for call set-up messaging (IAM) for LNP to work. (e.g., location routing number, forward call indicator, GAP)

Evolution of QOR

Why QOR

- Carrier Choice - Industry should work to establish a standard interface so that service providers can offer service in a truly competitive environment
- location routing number (lrn) data (not AT&T's LRN architecture) is the emerging LNP routing information between networks.
- AT&T's LRN architecture will have a massive impact on upgrades in networks mainly due to performing an LNP query for each interoffice call to a portable NPA-NXX.
- Network Impact of Number Portability must be minimized
  -Alternatives that query all interswitch calls have huge impact on the network
  -SS7 Network: Require additional links and STPs
  -Requires many SCP pairs

Why QOR?

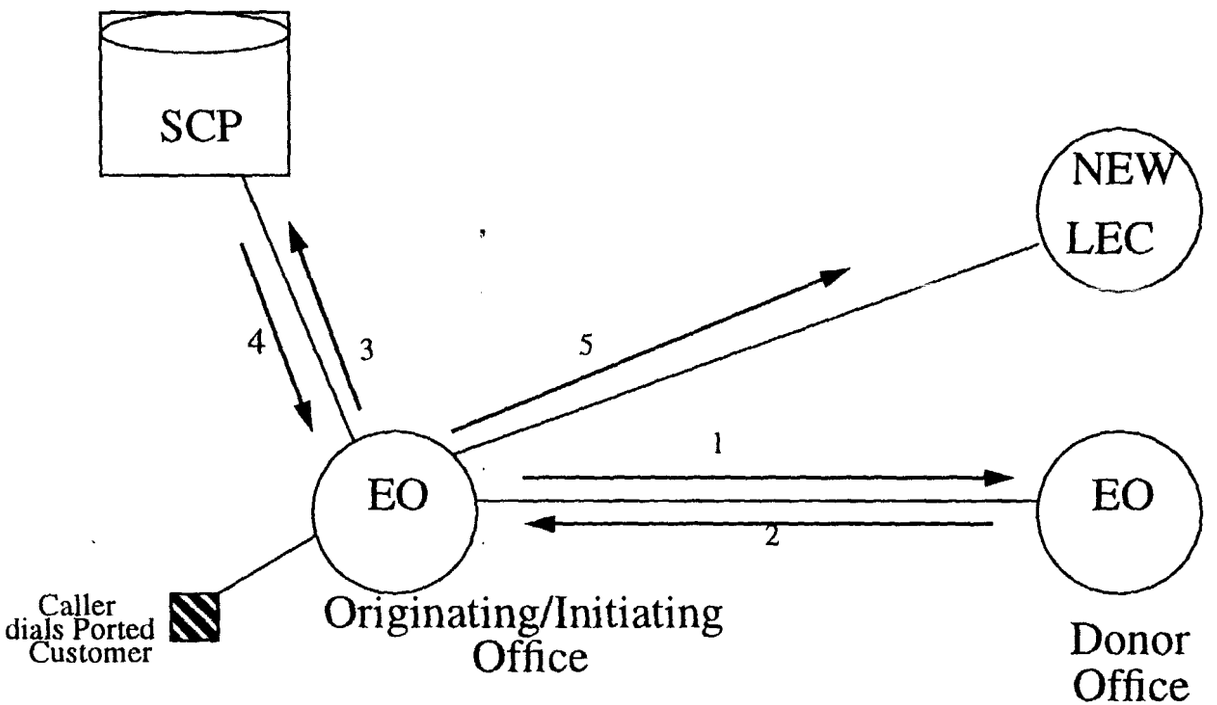
- QOR and LRN requirements are being defined by Bellcore and ANSI (T1S1.3).
- Only calls to ported numbers are handled differently than today. Non-ported customers should not be impacted by number portability
- QOR minimizes the number of interoffice LNP queries. Method was needed to avoid unnecessary interoffice LNP queries for non-ported numbers.
- Minimizes impact to:
  -SS7 Network: Require additional links and STPs
  -SCP pairs required to support query volume
  -SSP real time impact (i.e., Switch Capacity)

Query on Release

- QOR assumes that a dialed number has not ported and attempts to set up a call to that number.
- If the number has not ported the call completes.
- If the number has ported, the QOR initiating switch will be informed and it will then query the database.
- The call is then routed using the lrn routing information to the destination switch.

QOR Description

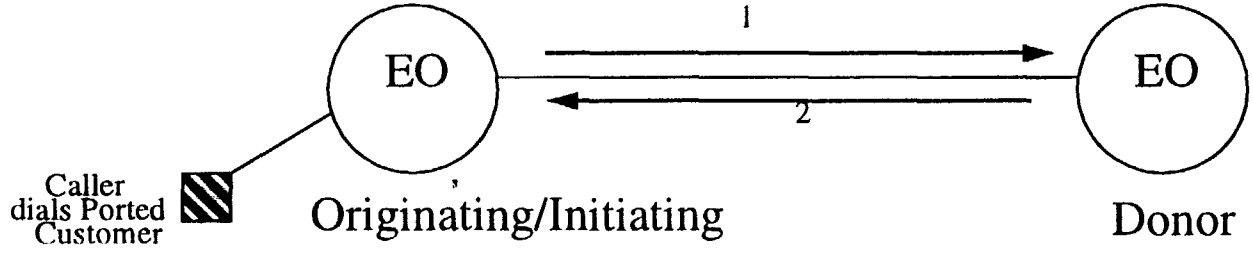
Query On Release - Call Flow



1. Originating switch attempts to set up the call to the donor switch. The dialed number and FCI are sent to the donor switch as part of normal call set up IAM.
    - The N bit in the FCI informs the receiving switch that this is a QOR attempt.
    - Call completes for non-ported numbers.
2. Release with cause value "NP-QOR number not found" is returned for ported numbers.
3. A trigger is hit and the initiating switch launches a query to the SCP.
4. The SCP returns the **lrn** and dialed number required to route the call to the appropriate destination switch.
5. Initiating switch routes the call based on the **lrn** with the dialed number placed in the GAP and FCI M-bit set and the call is then routed to the destination switch as with AT&Ts LRN architecture.

QOR Description

QOR Initiating Switch



An initiating switch launching a QOR attempt to a donor switch may expect the following response:

- A call-proceeding indication (i.e., Subscriber has not ported)
  - In this case QOR terminates and call processing resumes at the initiating switch

- Release indication
  -If the Release message indicates that the dialed number may be ported an LNP query is launched

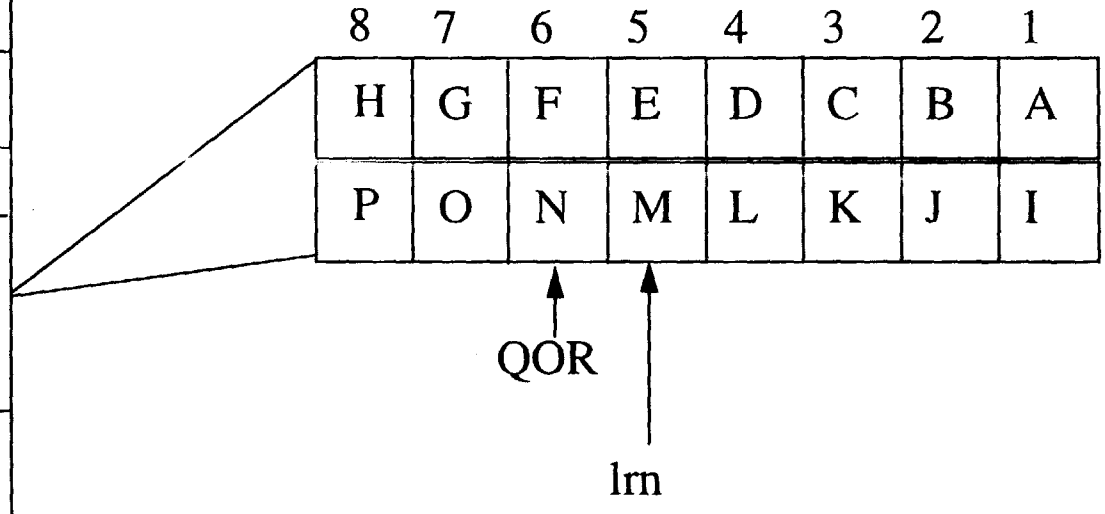
QOR Description

QOR Capability: IAM message from Initiating switch to Donor switch

IAM Message

Routing Label
Circuit Identification Codes
Message Type
Mandatory Parameters (e.g., Nature of connection indicator and Called Party Number)
Optional Parameters (e.g., Calling Party Number and Transit Network Selection)

Forward Call Indicator



bit N: QOR Attempt Indicator

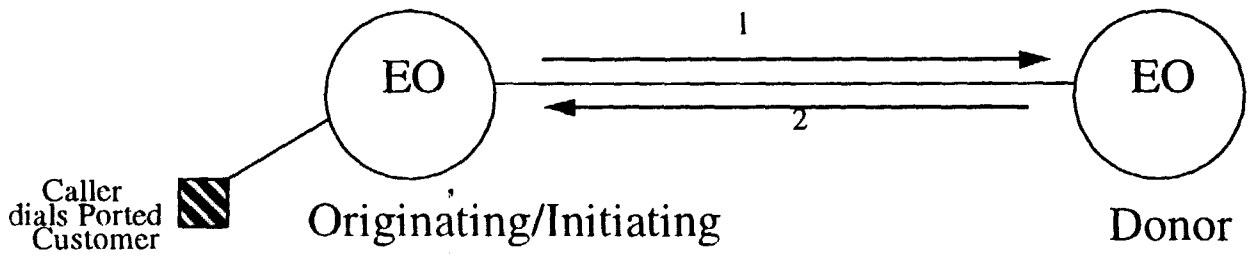
0 no QOR routing attempt in progress
1 QOR routing attempt in progress

bit M: Ported Number Translation Indicator

0 number not translated
1 number translated

QOR Description

QOR Donor Switch



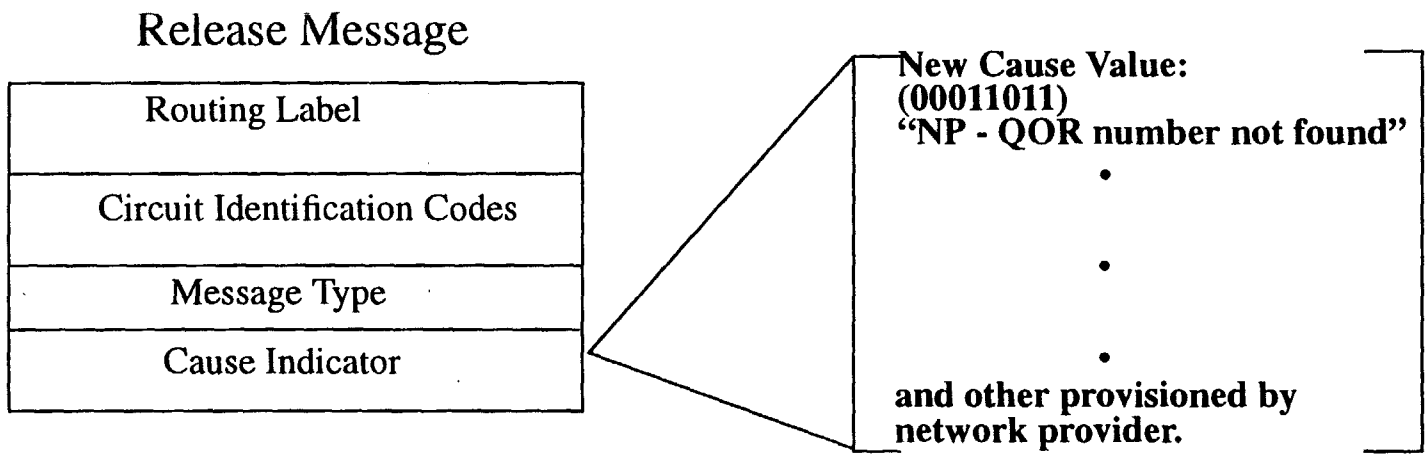
When provisioned with QOR Release Capability, the Donor switch will detect a QOR attempt by examining the FCI N bit (QOR routing attempt indicator) thus allowing it to skip any LNP triggers. It will then:

- attempt to terminate the call to the dialed number
- If the dialed number is not equipped on the switch the donor switch will release the call back to the QOR initiating switch.

The Donor switch will only complete calls for non-ported numbers allowing the QOR initiating switch to launch a query only on ported and vacant calls.

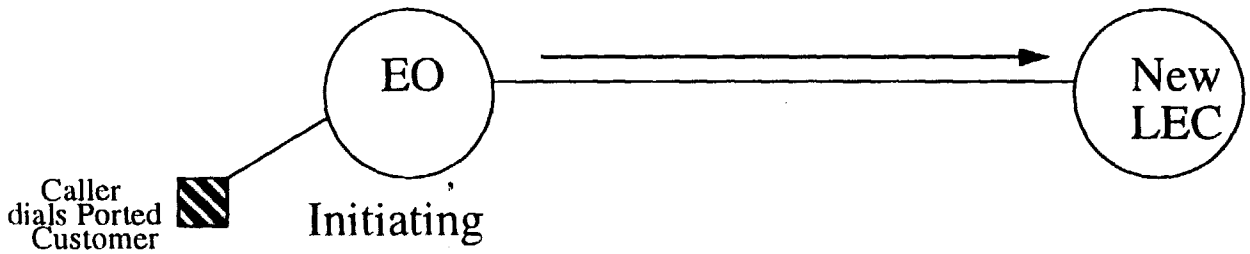
QOR Description

QOR Capability: Release message from Donor Switch to Initiating Switch



Various cause values and conditions can be provisioned in the initiating switch to invoke a query and then route the call to a ported number. Thus calls to ported numbers can be routed independent of network failures.

QOR Initiating Switch Routing after DB Query

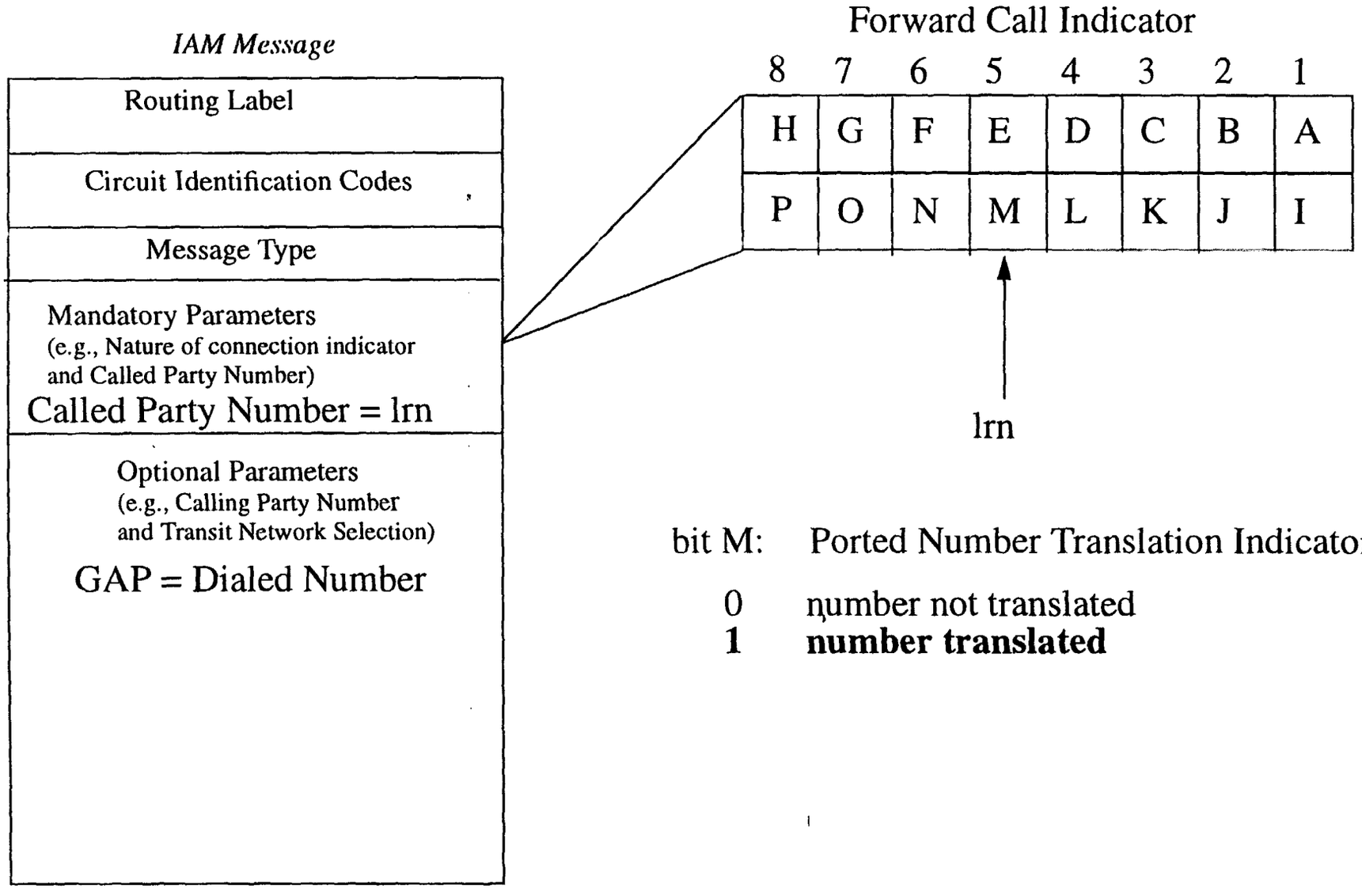


The QOR initiating switch after completing the data base query will now route the call based on the lrn. It will send an IAM to the destination switch with the following information.

Called Party Number = lrn
GAP = Dialed Number
FCI = "number translated"

QOR Description

lrn Routing: IAM message from Initiating switch toward Destination switch



bit M: Ported Number Translation Indicator

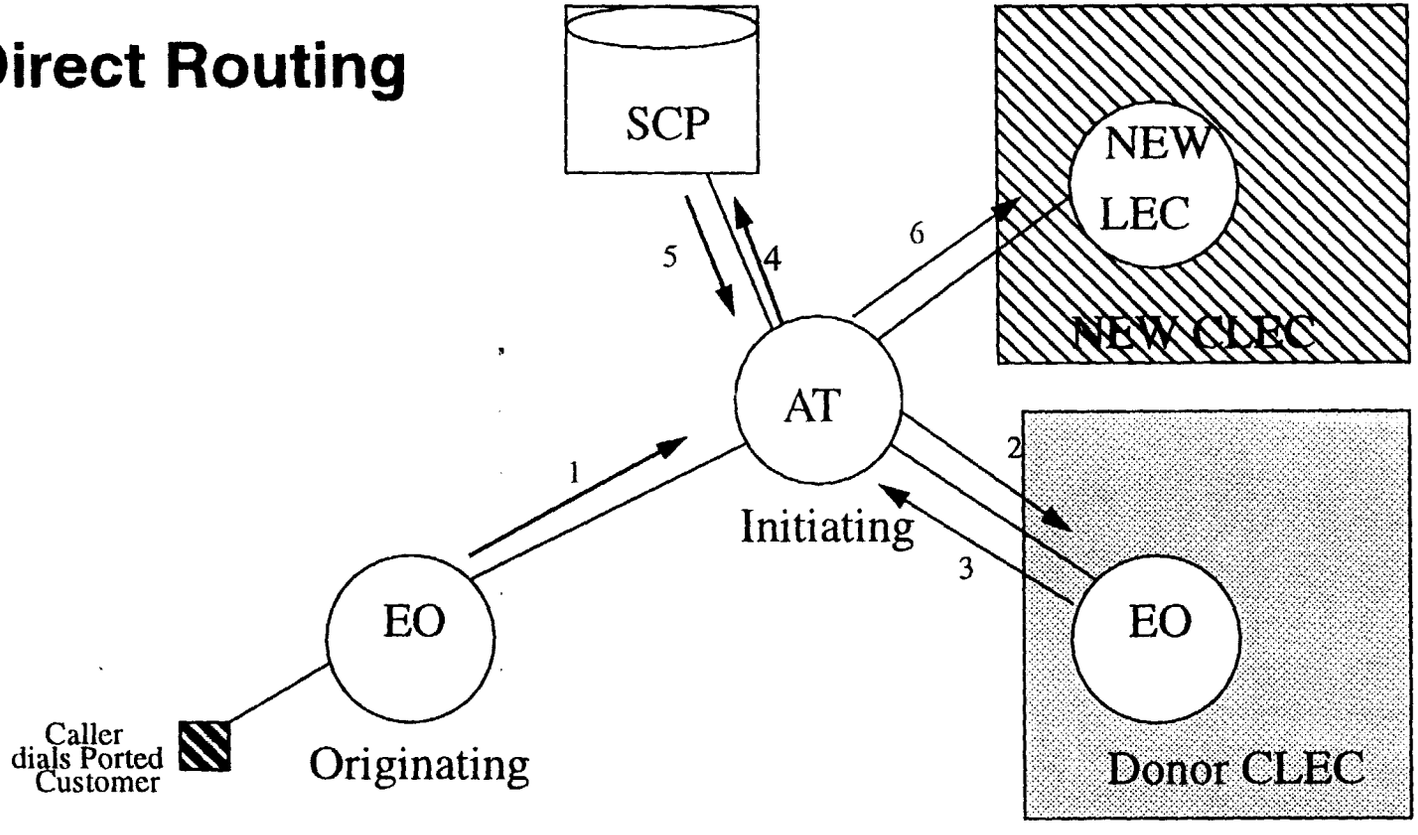
0 number not translated
1 number translated

QOR at Network Boundaries

- Intranetwork QOR does not affect external carriers
- Internetwork QOR supports direct routing to the new CLEC.
- Potential Internetwork options
  -Initiating network has QOR and donor network has AT&T's LRN.
  -Both networks have QOR.
  -Initiating network has AT&T's LRN and the donor network has QOR. Originating Carrier does query before routing the call (as per AT&T's LRN N-1 scenario). In this case having QOR does not enter into this scenario.

QOR Description

Direct Routing



1. Originating switch attempts to set up the call via the AT.
2. The AT sends the dialed number and FCI to the donor switch as part of normal call set up IAM.
    - The N bit in the FCI informs the receiving switch that this is a QOR attempt.
    - Call completes for non-ported numbers.
3. Release with cause value "NP-QOR number not found" is returned for ported numbers.
4. A trigger is hit and the initiating switch launches a query to the SCP.
5. The SCP returns the **lrn** and dialed # required to route the call to the appropriate destination switch.
6. Initiating switch routes the call based on the **lrn** with the dialed number placed in the GAP and FCI M-bit set and the call is then routed to the destination switch as with AT&Ts LRN architecture.

QOR Attributes

- QOR can be enabled or disabled on a per NPA-NXX basis.
- Service provider may choose to disable QOR for a particular NPA-NXX if SS7 connectivity to donor switch is not available.

Provisioning QOR

QOR initiating and donor switch requires minor provisioning for QOR to operate

- QOR can be enabled or disabled on a per NPA-NXX basis.
- QOR Initiating Switch
  - An indication for each portable NPA-NXX on whether QOR applies;
  - The set of ISUP Cause values that indicate further LNP processing
- Intermediate Switch
  -similar to provisioning needed for AT&T's LRN
- Donor Switch
  -Set QOR release capability
  -similar to provisioning needed for AT&T's LRN

10-Digit Global Title Translation

- 10-digit GTT routing is required for services such as CLASS

- For ported number, 10-digit GTT routing can be done in two different methods:

  A. SCP performs the 10-digit GTT

  B. STP performs the 10-digit GTT

- Method A: SCP performs 10-digit GTT

  - NP SCP will contain all the NP routing information

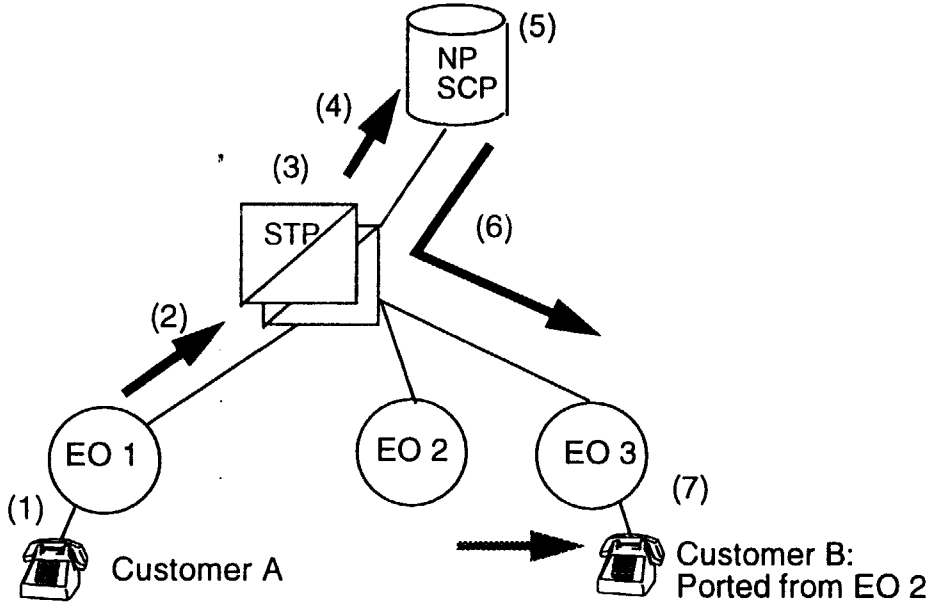
  - Need to handle network management functions associated with GTT routing

- Method B: STP performs the 10-digit GTT

  - Need to update existing GTT translation table

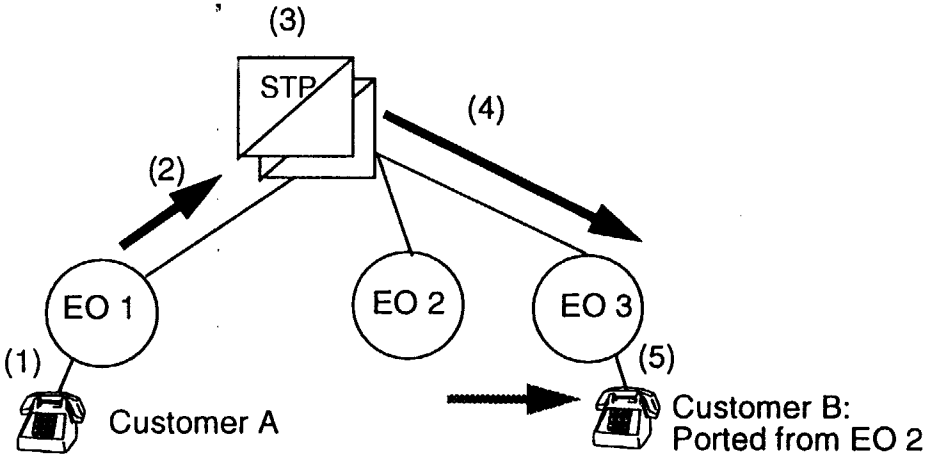
  - Require no additional link capacity between STP and NP SCP for queries requiring 10-digit GTT

10-digit GTT Routing for CLASS Services: Method A- SCP Routing



1. Customer A initiates an CLASS AC feature to Customer,B. B has ported from EO 2 to EO 3
2. EO 1 sends a CLASS query to STP
3. STP performs the 6-digit GTT based on the NPA-NXX of customer B and Destination Point Code (DPC) of NP SCP is derived.
4. STP routes the CLASS query to NP SCP based on the DPC.
5. NP SCP translated the ported DN of customer B into lrn and derives the associated DPC (of EO 3).

10-digit GTT Routing for CLASS Services: Method B - STP Routing



1. Customer A initiates an CLASS AC feature to Customer B. B has ported from EO 2 to EO 3
2. EO 1 sends a CLASS query to STP
3. STP performs the 10-digit GTT based on the NPA-NXX-XXXX of customer B and Destination Point Code (DPC) of EO 3 is derived.
4. STP routes the CLASS query to EO 3 based on the DPC.
5. When EO 3 receives the CLASS query, it will determine the status of customer B and a proper response will be formulated.

QOR Description

Summary

- Focused on differences between QOR and AT&T's LRN Architecture
- QOR is an industry solution that has been evolving to mitigate the network inefficiencies of AT&T's LRN Architecture.
- Pacific Bell has always supported Carrier Choice.
- QOR minimizes the number of interoffice LNP queries.
- Minimizes impact to:
  -SS7 Network: Require additional links and STPs
  -SCP pairs required to support query volume
  -SSP real time impact (i.e., Switch Capacity)
- The industry is finding alternate solutions to those proposed in AT&T's LRN solution (e.g., 10 digit GTT at the SCP)
- Provides full functionality to ported customers

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DRAFT

Version 0.4

Query On Release

FEATURE SPECIFICATION DOCUMENT

APRIL 29, 1996

Query on Release Feature Specification Document
Editors: I. Shumada, C. Luzine, Nortel Technology

TABLE OF CONTENTS

1.0 Introduction

Query on Release (QoR) is an enhancement that minimizes the number of database queries demanded by an AIN- or IN-based solution to LNP. In particular, QoR eliminates the need to query the LNP SCP on calls to non-ported DNs within a portable NPA-NXX. The Query on Release capability described in this document supplements the LRN capability defined in FSD 30-12-0001, Generic Switching and Signaling Requirements for Number Portability.

QoR is engaged by the (N-1) switch when it receives a call to a DN in a portable NPA-NXX. QoR routes the call over ISUP facilities to the donor switch instead of launching an LNP query. If the called DN has not ported, the call terminates at the donor switch; otherwise, the call is released back to the switch undertaking QoR. This switch then performs the LNP query. Standard LNP processing prevails thereafter.

2.0 Background

QoR enhances the capabilities described in FSD 30-12-0001, Generic Switching and Signaling Requirements for Number Portability. QoR is not a stand-alone capability; it is for use with LNP. An office capable of QoR is, by implication, capable of LNP.

QoR is an optional and administrable capability; it can be enabled or disabled at each QoR-capable switch for each portable NPA-NXX.

QoR can be initiated by any QoR-capable office. Intermediate and terminating switches can distinguish a QoR routing attempt from a regular call-attempt by means of a new *Routing Attempt* indicator included in the ISUP IAM FCI parameter. The *Routing Attempt* indicator is set in the ISUP IAM FCI during a QoR routing attempt to

- inhibit LNP queries at succeeding switches, and
- coerce succeeding switches to release the ISUP connection if the QoR routing attempt fails to locate the called DN at the donor switch.

QoR routing attempts should not be directed toward intermediate and donor switches that lack the software necessary to recognize the new *Routing Attempt* indicator in the ISUP IAM FCI, unless these switches can be administered to release the ISUP connection by other means if the QoR routing attempt fails.

QoR is most effective when the percentage of DNs in a portable NPA-NXX that have moved off the donor switch is low to moderate — because in this case the probability of finding the DN at the donor switch during the QoR routing attempt is high. The use of QoR for portable NPA-NXXs in which a large number of DNs have ported is discouraged.

QoR relies on ISUP's ability to RELease connections back to the initiating switch when a routing attempt fails to find the called DN at the donor switch. Should a routing attempt encounter MF interworking, the initiating switch has no choice but to discontinue QoR, since the MF connection cannot be collapsed. In this case, the switch receiving the routing attempt over the MF facility will complete the call successfully, but perhaps at the cost of trunk tromboning. The use of QoR at a particular switch for a given NPA-NXX is discouraged if ISUP routing to the donor switch is not available.

3.0 User Perspective

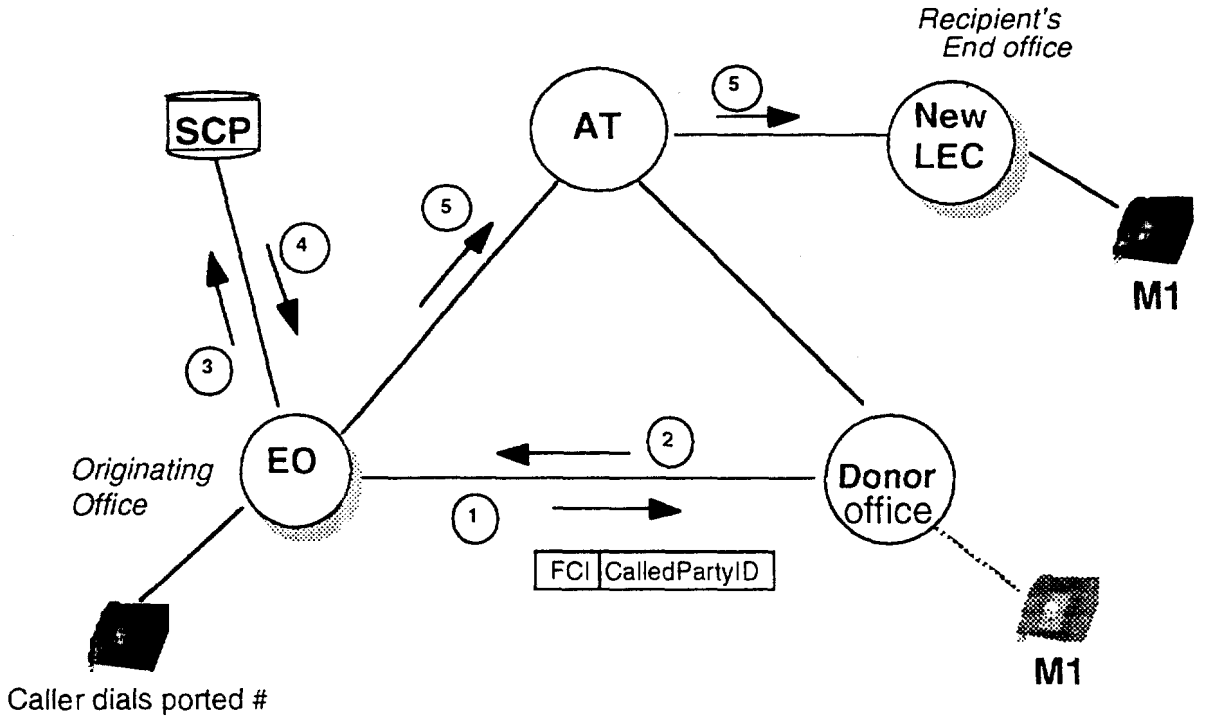
QoR is a system-initiated capability; the end-user cannot explicitly activate QoR, and is unaware of QoR's operation.

QoR does not interfere with the originator's ability to designate an interexchange carrier for a call; QoR adheres to the (N-1)-carrier paradigm for LNP queries.

4.0 Call Flows - Network Views

Figure 1 below depicts the call flow for a number portability scenario with the Query on Release enhancement.

Figure 1: Basic Call Flow Network View



In the above network scenario

1. The originating End Office attempts to set up the call to the donor switch by sending an ISUP IAM message. The dialed number and the FCI are sent to the donor switch as part of the normal call set up
   - the FCI prevents the receiving switch from launching an LNP query
   - for non-ported numbers, the call is completed
   If the DN is not found at the donor switch, the call is released.
2. A Release with cause value = unallocated DN is returned to the originating switch.
3. The LNP trigger is hit once Query-on-Release is completed for a ported number, i.e., upon receiving a Release message with cause = unallocated DN, the originating office sends a query to the LNP SCP.